

PIER Wisconsin

Milwaukee, WI

Increasing public understanding of freshwater, both as a commodity
and as an intrinsically important part of the environment

PROJECT NARRATIVE

PROJECT PURPOSE

*PIER Wisconsin*TM, formerly the Wisconsin Lake Schooner Educational Association, requests \$700,000 from the Technology Opportunities Program (TOP) to support technology-based programs for a new museum/aquarium facility of the same name being built in Milwaukee, Wisconsin. The requested funds will be used to:

1. *Develop, design, produce and evaluate @ 36 live, interactive programs* broadcast from the deck of the *S/V Denis Sullivan*, *PIER Wisconsin*'s re-created 19th century, three-masted Great Lakes Schooner, floating classroom and research vessel.
2. *Design and install a network of 12 interactive touchscreen kiosks* at *PIER Wisconsin (PW)* and *select partner institutions*, using a combination of wireless web and broadband Internet technologies, for the purpose of disseminating both live and pre-produced scientific and cultural programming from *PW*.
3. *Pilot test a Lake Michigan-based, interactive digital network* with a diverse, public/private coalition of community partners engaged in freshwater research and education, with the ultimate goal of increasing public understanding of, and involvement with, freshwater-related issues.

IDENTIFIED NEEDS

Need to Establish a Community Resource and Electronic Network Focused on Fresh Water. Milwaukee is a major port city on the Great Lakes with a population of over 1.5 million. Numerous local organizations, exemplified by *PIER Wisconsin* and partners, are dedicated to public education on the environment, natural resources, human health and sustainability. Yet Milwaukee does not have a centralized informal science education facility dedicated to the communication and dissemination of freshwater-based science content and programming to the general public; nor is there an effective inter-organizational network (electronic or otherwise) to facilitate collaboration between local institutions with parallel missions and programs.

Need to Increase Involvement of Community Stakeholders and Citizens in Addressing Freshwater and Great Lakes-related Issues. Many residents of Milwaukee and other Great Lakes communities lack the resources to make informed decisions about environmental issues that directly affect their quality of life. This problem is compounded in socio-economically disadvantaged populations, many of whom live in heavily degraded areas with limited access to relevant information—much of which is now communicated via technological pathways.

Need to Develop New Models for Community-Connected Environmental Education. The integrity of the Great Lakes and freshwater resources around the globe are threatened by loss and degradation of habitat, urban growth, the invasion of exotic species, and the cycling of toxic chemicals and pollutants (IJC, 2001). These issues are so urgent that the United Nations has declared 2003 the “International Year of Fresh Water” (Resolution #55/196). An important element in addressing these issues is practical knowledge coupled with effective and ongoing environmental education. A new program model employing the power and connectivity of interactive network technologies is needed to answer these urgent environmental and educational challenges.

Need to Enhance Science and Technology Literacy. Effective instruction in the sciences is an active process, not one in which knowledge is viewed as an inert body of facts (NRC 2000). Exhibits and programs planned for *PW* will be integrated, cross-curricular, process-driven and technology-enhanced activities designed to: 1) increase science/technology literacy, and 2) prepare citizens to become informed stewards of freshwater and other natural resources.

PROPOSED SOLUTION USING NETWORK TECHNOLOGY

The programs outlined in this proposal (live interactive web and videoconferencing broadcasts from the *S/V Denis Sullivan* and *PIER Wisconsin*, a network of interactive kiosks, and inter-organizational, electronic network upon which to share program initiatives, events and digital links) capitalize on information access made possible by interactive, broadband and wireless network technologies.

Through these technologies, end users can: 1) actively participate in real-time programs and 2) share information in an on-demand basis. End users (students, teachers, other researchers and members of the general public) will take part in an on-going public dialogue about freshwater issues via the above interactive programs. Programs will encourage and enable end users to take concomitant educational, civic and social action in order to find solutions to the issues presented. The audience for these programs will be extended through the basin-wide voyages of the *Denis Sullivan*. Additional pilot communities in Wisconsin that are visited as ports-of-call (e.g. Port Washington, Manitowoc and Racine) will be encouraged to link to these digital resources and to join the interactive network.

MEASURABLE OUTCOMES

- **A digital, interactive network of sister institutions utilizing broadband, wireless web technology, and 12 networked touchscreen kiosks.** These kiosks will reside at the new *PIER Wisconsin* facility, at three partner institutions in metropolitan Milwaukee, and at three other Lake Michigan ports-of-call. The network will be led by *PIER Wisconsin* for the purpose of facilitating both citizen and student/teacher involvement with, and dialog about, freshwater issues such as environmental quality, human health, biodiversity, natural resource management and economic growth. This network will also increase members’ effectiveness with educational resource management and cross-institutional program development.

- **Wireless broadband technologies installed on the *S/V Denis Sullivan*** will facilitate real-time, interactive educational programming that can be broadcast back to *PIER Wisconsin's* 144-seat, high definition theater and other remote sites in the network.
- **An interactive *Voyage of Discovery* web site for the network** where end users can access information about, and actively participate in, freshwater programs sponsored by *PW* and its partner institutions as well as follow the exploratory voyages of the *Sullivan*.
- **An alliance-based, interdisciplinary team** of scientists, educators and technology experts dedicated to increasing public access to, and awareness of, current scientific research on freshwater resource issues and the Great Lakes ecosystem.
- **End users' experiences** including: inquiry-based activities designed for caregivers and children on Great Lakes/freshwater topics themes; interaction with featured scientists and community leaders (role models) via web-based interactions, chats and data-bases.

TARGET COMMUNITIES

PIER Wisconsin's technology-based exhibits and programs are designed for general public and K-16 educational use, with a focus on middle- to high school students and their teachers in southeastern Wisconsin. Urban and rural youth representing disadvantaged and at-risk populations will be targeted through active partnerships with: 1) Milwaukee's Sixteenth Street Community Center, which works with inner city, Latino and black communities living in Milwaukee's Menomonee River Valley; 2) Milwaukee Public Schools, which serves 105,000+ students (61% African American, 19% White, 13% Hispanic, 4% Asian and 1% Native American with approximately 74 from low-income families); 3) the SWING Network, a member of the Wisconsin Association of Distance Education Networks (WADEN), which serves 40 networks and over 500 sites in more than 350 Wisconsin communities, including significant rural populations often unable to access content providers located in larger, urban centers; and 4) the University of Wisconsin-Milwaukee's Center for Science Education, which serves regional schools representing a broad mix of socio-economic audiences.

INNOVATION

This project will use existing network and interactive technologies to create an on-line community of end users linked to the real-time research voyages of the *S/V Denis Sullivan*, as well as to a diverse constellation of information generated by a broad alliance of educational and science institutions engaged in freshwater, resource management and public health issues.

National Context. Freshwater resource management and related environmental and economic issues have national significance in the arenas of public health, environmental integrity, sustainable economics and quality of life. Numerous agencies dealing with these issues (e.g. NSF, AAAS, NOAA, NASA, EPA, UN-UNEP, WHO and local health organizations) are

actively pursuing ways in which to increase communication with community partners and the common populations they serve. These ways include collaborative scientific research, environmental education (e.g. Project WET: Water Education for Teachers), publications (both print and electronic), media programs (e.g. *Water: The Drop of Life*), web-based resources, and local stewardship initiatives like “Adopt-a-River,” “Adopt-a-Lake,” and “Waters of Wisconsin.”

Potential Model for Other Communities. Significant population centers have grown up near and around water resources. The Great Lakes Basin is home to over 33 million people (U.S. EPA & Environment Canada, 1995). These same resources are now under severe stress from human activity. Programs that effectively link citizens with information about freshwater via electronic networks can become models for other Great Lakes communities dealing with environmental resource management and economic issues. It is the ultimate intent of *PIER Wisconsin* to serve as a Great Lakes Basin-wide model and resource center for addressing regional needs vis-à-vis freshwater resource management and environmental education. The information and educational models developed through this project (interactive live programs, touchscreen networked kiosks and the web site) can inform parallel efforts in other communities, and can serve as the starting point for an interdisciplinary and networked effort to address Great Lakes basin-wide concerns.

DIFFUSION POTENTIAL

Dissemination and Replication by Other Communities. The activities outlined in this project lend themselves to the use of existing and emerging technologies (ITFS, Internet, videoconferencing, and wireless web), deal with common/universal content and issues, and involve partner institutions common to many Great Lakes basin communities (museums, schools, health centers, universities and colleges). Results from this project will be shared with communities around the Great Lakes via the web, professional publications, media programs, workshops and conferences. Communities that serve as ports-of-call for the *S/V Denis Sullivan* during her educational voyages will be targeted. After this initial pilot program, these same communities will be encouraged to actively participate in a basin-wide interactive network in order to share information germane to our common freshwater resource issues.

PROJECT FEASIBILITY

Technical Approach. *PIER Wisconsin* will adapt emerging wireless web and broadband technologies to permit live, two-way audio with quality video interaction between the *Denis Sullivan* educators, on-board scientists and student crew members, and students and educators throughout the metro-Milwaukee area — and if broadband connected, with participants throughout the world. This Wireless Web technology will use third generation (3G) assigned Instructional Television Fixed Services (ITFS) frequencies to provide the broadband connectivity. Project partners (MPS, UWM, and MATC) have 12 licensed channels that are available for educational programming that we will be able to use to deliver content. UW-Milwaukee will be conducting ITFS/wireless web field trials in June 2002 in collaboration with technology vendors who have developed Internet connectivity for the ITFS spectrum.

Rational for using these technologies. The connecting technologies selected for this project are designed to minimize the digital divide. The project participants “own” the distribution systems, and as a result the connectivity costs will be minimal. The use of a non-line-of-sight wireless web system ensures virtually ubiquitous interactive access to program experts. Since ITFS channels are reserved for educational use in most metro-areas, the program outcomes will be replicable throughout the Great Lakes basin. Technological applications identified in this grant are 1) already in use with significant, proven track records of success, and 2) have been researched and where possible, field tested directly by project staff or through other organization’s reports of same.

Interoperability. The technologies identified for use in this project will be integrated based upon review and assessment of existing educational models employing convergent technology (e.g. *The JASON Project*, *Polar Husky Project*, and *Drop of Life Project*). The project will utilize a tapestry of technologies that are designed to work together. All program elements will be web accessible. The wireless web/ITFS system will tie into the Milwaukee Area Information Network, a metro-Milwaukee fiber network that links all program participants, and through UWM, to a point-of-presence (POP) in Chicago that links to the world. One expected outcome of this project is to explore more effective ways to connect people to science and to each other.

Technologies being explored include: digital multicast (broadcast television), Internet technologies (videoconferencing, collaborative work spaces, wireless web, and streaming media), satellite teleconferencing, videotape, CDROM, and DVD. Media developed for one medium will be designed to easily move to one of the other delivery technologies. The educational and interactive technologies the project expects to implement are part of the basic delivery systems used by MPS, UWM, and MATC. As such, the institutions have set up maintenance agreements, and educational programming that will ensure long-term viability of the technologies and delivery systems used by the *PIER Wisconsin* project.

Scalability. Because this project is Internet-based, distribution throughout the country is affected by available bandwidth. In Milwaukee, through the MAIN network, sufficient bandwidth exists to support high quality interactive content. The ITFS-based wireless web delivery system, will take advantage of underutilized bandwidth in that spectrum. The NIA (National ITFS Association) supports more than 1,200 ITFS educational licensees in the U.S., with most looking for more innovative use of their ITFS channels. A successful *PIER Wisconsin* project will be the model for educators throughout the country, with a primary audience composed of communities throughout the Great Lakes Basin.

Applicant Qualifications. Project staff has extensive practical experience with the design and utilization of technology-based content delivery systems and the scientific content forming the basis for this project. Full biographical sketches of senior personnel are located in Appendix II. A full list of Project Personnel and Advisors is located in Appendix III.

Project Co-Directors. Prior to his current position with *PIER Wisconsin*, Project Director Rolf Johnson spent 24 years at the Milwaukee Public Museum as a Curator of Paleontology (1978-2001) and as Director of the Center for Media and Instructional Technology (1991-2001). Co-PD John Grozik is the Director of the University of Wisconsin-Milwaukee's Instructional Media Services department, Information and Media Technologies Division and has more than 20 years experience with interactive technologies. Co-PD Bill Nimke has been Director of Education at WLSEA (now *PIER Wisconsin*) since 1993, and is directing the *Science Under Sail* and *LakeWatch* Expeditions programs. Caroline Joyce is Director of Educational Programs for the Jason Project and has extensive experience in the design and delivery of interdisciplinary curriculum via technological pathways.

Partner institutions involved with *PIER Wisconsin* program initiatives have experience with:

- Content Development (*PIER Wisconsin*, UWM, Wisconsin Academy of Science)
- Technology Applications (*PIER Wisconsin*, UWM, SWING, MATC)
- Community Service (Sixteenth Street Community Center, MPS, MU)
- Educational Program Development (MPS, SWING, UEC, UWM, *PIER Wisconsin*, MU)

Budget Overview. A complete budget narrative is located in Appendix I.

Personnel	\$244,450
Fringe Benefits	\$77,143
Travel	\$55,360
Equipment	\$76,000
Supplies	\$59,100
Contractual Services	\$181,000
Other	\$1,053,902
<i>Total Direct Charges</i>	\$1,746,955
Indirect Charges (Non-Federal)	\$104,696
<i>TOTAL BUDGET</i> (Federal and Non-Federal)	\$1,851,651

IMPLEMENTATION

Timelines and Project Milestones. A spreadsheet outlining major project milestones, their start and end dates and current status, if applicable, is included as Appendix IV.

Institutional Commitments to Project. To date *PIER Wisconsin* has raised \$14.9 million for the construction of *PIER Wisconsin*, has another \$13.5 million in pending construction and public programming proposals, and is actively soliciting funds from other federal agencies, corporations, private foundations and individuals. *PIER Wisconsin* is committed to raising all the necessary capital funds, as well as \$5 million for educational programs, of which this technology-based program is a significant component.

COMMUNITY INVOLVEMENT

Significant community interest and involvement is being generated by the *PIER Wisconsin* project. This involvement includes content providers, content disseminators/program developers, schools, service agencies, community groups and local and regional units of government. Alliance Partners collaborating on *PIER Wisconsin* exhibits, public programs and educational curriculum include the University of Wisconsin-Milwaukee, University of Wisconsin-Madison, Marquette University (MU), Wisconsin Department of Natural Resources, Milwaukee Metropolitan Sewerage District, Wisconsin State Historical Society, Milwaukee Public Television, Milwaukee Area Technical College, Mote Marine Labs, Milwaukee Public Schools, Sixteenth Street Community Center, Urban Ecology Center, Southeastern Wisconsin Interactive Network Group and the Wisconsin Academy of Sciences, Arts and Letters.

EVALUATION

Note: PIER Wisconsin will seek a deferral of IRB approval if awarded a grant, since our research involves the direct observation of children.

Evaluation Questions. Front-end evaluations of program content, interpretive strategies, technological tools, and take-home messages were completed in 2001 using focus groups, educator surveys, systematic reviews by the *PIER Wisconsin* Education Advisory Council and workshops with Marquette University's Center for the Transformation of Learning. Project staff is conducting a literature survey to uncover citizens' major concerns and questions about the Great Lakes to be addressed in *PIER Wisconsin* programming, including: Are the fish safe to eat? Is the water safe to drink? Are the beaches safe for swimming? And, since September 11: Is our water safe from biological terrorism? (IJC, 2001).

In addition, The Wisconsin Academy of Science, Arts and Letters has conducted a series of community forums throughout the State of Wisconsin as part of the *Waters of Wisconsin* (WOW) Project initiative, with the goal of involving citizens in the "protection, restoration and sustainable development of Wisconsin's waters for our communities and for all living things, both now and in the future." The results of these extensive public surveys and forums will be published by the Academy in October, 2002, and will inform the formative evaluation of the *PIER Wisconsin Voyage of Discovery* program.

The formative evaluation will assess questions, including:

- What do our constituent communities and stakeholders (potential end users) want to know about the Great Lakes, local rivers and freshwater?
- What do they know, about these topics already? What don't they know?
- What resources do these communities need to increase public understanding, exploration and resolution of freshwater issues?
- What technologies exist (infrastructure) for serving communities?
- What (if anything) keeps people from effectively using these resources?
- What do our partners need help with in the dissemination of services? Interactive programming? Linking related program efforts?

Summative evaluation will assess the overall success of the project, including:

- Was there a net increase in the involvement of the public and enrollment of schoolchildren in *PIER Wisconsin* and individual partner institution programming revolving around the content areas outlined in this project initiative?
- Did this involvement translate into end users having access to and using information on freshwater-related issues?
- Did end users' attitudes about their freshwater resources change in a positive way? Did their knowledge demonstrably increase? (measures of cognitive and affective change)
- Did end users actively participate in the featured freshwater/Great Lakes research opportunities provided (Citizen Science events)?
- Did end users access and/or contribute information to the *Voyage of Discovery* research databases?
- Did end users attitude about using network technology change (positive or negative) as a result of participating in these program initiatives?

Evaluation Team. The formative evaluation contract has been awarded to Inverness Research Associates of Inverness, California, directed by Dr. Mark St. John. In addition, *PIER Wisconsin* is assembling a Peer Review Panel of invited experts in the fields of exhibit and program design, audience research and technology for a summer 2002 meeting to provide feedback on our formative plans.

Dissemination of Results. *PIER Wisconsin* will disseminate the results of front-end, formative and summative studies and well as reports on the process of developing the *PIER Wisconsin* network and programs through press releases; a comprehensive *PIER Wisconsin* web site; articles in the popular press; local, regional and national television spots; an in-house, documentary television production; and publications in professional journals such as Curator and Museum News, as well as in the Wisconsin Academy Review and other educational journals. Project personnel will present at regional and national conferences (e.g. ASTC, AAM, AMM, AZA, SEA). Live programming, including “*Live from the Denis Sullivan*” broadcasts will be shared as a potential model for other organizations and communities working on parallel “citizen science” activities. *PIER Wisconsin* also publishes two publications that will feature reports on our progress and model curricula: *Schooner News* (quarterly, circulation 10,000) and *WaterLines* (bi-monthly to 1,500 educators, organizations and businesses in metropolitan Milwaukee).

Conclusion. The outcome of critical issues facing the Great Lakes and the world's supply of freshwater will shape the future of human life — and the lives of countless other species on Earth. The goal for the *PIER Wisconsin* project, and for each of its associated public programs, is to develop and nurture a community of students, teachers, citizens and researchers who are informed stewards of freshwater and the environment. Empowering citizens to actively explore their connections to the natural world has now become a matter of survival, as well as an important mechanism for increasing our collective quality of life. Technological tools can and must play a role in this educational mission. Only an informed, scientifically literate and connected community of people will be able to make the tough political, economic and social decisions necessary to protect and conserve this limited resource now and for future generations.